# MAGNETISM TO CONTROL COMPRESSIVE FRICTION CHECKS FOR RODS INCLUDING THOSE OF DOOR CLOSERS

## Technical Field

This invention relates to various reciprocating devices that control certain and objects with linear biasing forces. Exemplified is a door closer that acts to return the door to a closed position. The device normally comprises a rod that reciprocates from within a body providing a biasing means to the forces. For holding the door in an opened position, the rod can be loosely mounted with a frictional check mechanism. Also known as a hold-open tab, it mounts onto the rod through an aperture. When triggered, the tab frictionally engages the extended rod with compressive opposing points comprised within the aperture.

More particularly, this invention relates to the use of a magnetic means to trigger checks for engagement and release, such as for holding the door opened and then permitting closure. The numerous inventions disclosed herein might not be possible without including Alonso's other inventions to improve reciprocating devices, as described in US Pats D395,995; D425,776; D425,399; 5,953,789; 6,032,331; 6,397,431; 6,640,387 all to Alonso. 

## Background Art

Check mechanisms are normally metal stamped from a sheet steel and comprise two relevant components to the invention herein: the aperture and the trigger. The reader is encouraged to study a complete disclosure concerning various checks in US 5,953,789.

The hold feature is activated by first opening the door to a desired position which also extends the rod. A counter-force is then created as a result of the biasing means within the body. To hold, the check is axially positioned onto the extended rod through the aperture. Releasing the door, the biasing means acts to return the extended rod for closure. Once the body contacts the trigger, the biasing force causes the check to lever and torsionally pivot on the lineal axis of the rod.

The check frictionally engages the extended rod with compressive opposing points within the aperture. The force is equalized and distributed by the points within an axial plane, interacting to deliver the compressive frictional pressure onto the rod. Thus, the compressive frictional pressure created by the points causes the check to engage the rod and hold the door. More torsion applied to the trigger normally results in more compressive frictional pressure onto the tensile surface of the rod.

Other than the inventor's check, most others utilize only two compressive friction points offered within the aperture. These two points are distantly opposed at no less than the rod diameter. Most two point checks are initially sufficient to hold the door opened, however the points eventually wear causing slippage on the rod and unintentional closure. Fatiguing points lack stability onto the smooth cylindrical surface of the rod, which causes the check to rotate laterally as more torsion is applied onto the trigger. This lateral rotation further inhibits the compressive friction, which ultimately causes the check to slip and fail.

Comparatively, the inventor's check comprises an aperture that applies more than two compressive opposing points. The distance between the points is less than the rod diameter, applying more friction and balances the check to overcome lateral instability. The structure which houses the aperture is offset, separating the points over a larger tensile area. As the points wear they actually become stronger by distributing more compressive friction. The offset permits a vertical posture for the check which provides a continual engagement onto the rod. That is, the check keeps itself engaged by its own weight with no further pressure required. The offset also allows the check to substantially rotate in reversal up to 45°, to allow it free-slide similar to a guide or bearing when not needed.

A variable trigger plane is defined in US 6,032,331, although not entirely necessary for the inventions herein. The trigger comprises a continual curvature surface which increases the leverage for the compressive points, and, coincidentally decreases the applicable torsion required to engage the check. However, the more torsion that is applied to the trigger results in more compressive frictional pressure applied onto the rod.

Combining the above inventions creates a phenomenally strong and reliable check that should never slip or wear, as tested to over 300 lbs of direct linear force continually applied to a present check. The amount of compressive frictional pressure that can be

applied by the points is only limited by the tensile strength of the rod. Not even a coat of lubricant seems to affect the check once it engages. The inventor believes that these components mostly render all of the inventions herein as well as others soon to be disclosed.

There are several known options for engaging and releasing check mechanisms, individually all presenting virtues and tribulations:

The first shall be referenced as *Basic Tab Set*, the most reliable way to hold a door opened. The tab must be manually placed onto the extended rod by the user who must first open the door then slide the tab from idle. The tab's trigger contacts the closer body and torsionally causes the check to lever. However, in order to close the door the tab must again be returned back to idle. This basic option poses inconvenience particularly for children, and disabled people using mobility devices whom may not be able to easily move the tab. Fingers are often pinched by the trigger, especially when attempting to set a fatigued check.

The second option shall be reference as *Immediate Tab Set*, partially deriving from the inconveniences described above. A recent door closer comprises a pushbutton to engage the check for holding the door. Once the button is pushed, a lever causes the tab to immediately engage and hold the door opened. The most desirable feature about this device is that the user needs only push the door further outward to cancel the check for closure. A spring within the body cancels the tab once the torsion to the trigger is relieved. However, the check tab may be compromised by premature closure from incidental bumping to the door. This becomes apparent when moving large objects through the doorway such as furniture, and especially for users of mobility devices such as wheelchairs and walkers.

The third option shall be referenced as *Progressive Tab Set,* available for holding the door at every outward position. Some devices use a dial adjacent to the tab which is rotated for engagement. The most desirable feature about this device is that it omits premature closure, by the continuing hold as the door is pushed outward. However, in order to close the dial must again be rotated which may too create difficulties for certain users.

The fourth option shall be referenced as *Limited Tab Set*, requiring that the door be opened to approx. 90° in order to engage the tab. Similar to the pushbutton device, to close the user need only bump the door slightly outward to cancel the tab. However, most users

may not always desire that their door be fully opened just for setting the check. Some manufactures for these devices are now including a separate manual tab for checking the door at less than the full open position.

It becomes apparent that a single closer device should be created to encompass many of these check options, wherein each may become circumstantially available and disposable.

**Disclosure of the Invention**

These inventions relate to the use of a magnetic means to trigger check mechanisms for reciprocating devices, thus creating the first known door closer capable of most the check options described above. Objects of these inventions are to create a check tab capable of basic set, immediate set, and progressive set. Other objects of these inventions are to create reliable power for controlling the check, versus other mechanisms such as springs or levers.

A primary magnet can be easily manufactured into to the closer and into the check. However, for immediate adaptation onto certain closers the magnet can be housed within a simplistic plastic cup to easily retrofit without any modification to the device. Objects of these inventions are to utilize components having no fasteners, no moving parts, and minimal cost. The cup or end cap may further comprise surfaces that control the various check options. Objects of these inventions are to create versatility for the check and the device.

By locating the primary magnet horizontally, the tab is drawn sideways to freely travel on the rod as the door opens and closes. When needed, the tab becomes convenient for immediate set similar to the pushbutton device. However, the force required to set the magnetic check is no more than the touch of a feather. This ease of operation promptly disposes the tab at every position including full open set. To close the door the user need only bump it slightly outward and the magnet then disengages the tab.

If the user requires that the door be held reliably such as for moving furniture, the manual tab option is available by simply twisting the tab to its normal vertical position. The unique shape of the tab's trigger does not allow pinched fingers. For disabled users, a second temporary magnet comprising minimal moving parts will progressively hold the door at every outward position. Utilizing a damper as defined in US 6,397,431 that could open the door,

an inexpensive low-voltage operator could be created for residential entry doors. Such a device will perform as a reliable closer only, until remotely activated to power the door.

## Description of the Drawings

Fig.1 is a prospective view of the invention, a magnetic means to control check mechanisms for reciprocating devices including door closers.

Fig.2 shows the magnet positioned for immediate adaptation onto a door closer device.

Fig.3 foremost shows a superior check mechanism, the check also shown vertically mounted onto the closer in both the idle and engaged positions.

Fig.4 shows the check detained horizontally by the magnet, now immediately available for setting by the user with no more force than the touch of a feather held within the hand.

Fig.5 shows an exposed side of view of the door closer adapted with the magnetic invention.

Fig.6 shows another magnetic invention comprising a temporary wheel for progressively controlling the tab.

Fig.7 shows the door closer now mounted with the progressive magnet in the off position.

Fig.8 shows the progressive magnet in the on position.

Fig.9 shows a reciprocating device and check mounted with the invention, and a low-voltage operator capable of converting a normal door closer into an inexpensive door opener.

Fig.10 shows a door in the closed position with the device of Fig.9.

Fig.11A shows a remote signal which may command the invention to open the door.

Fig.11B shows the advancing magnetic invention preparing the device to open the door.

Fig.12 shows the door with the device of Fig.11B.

Fig.13 shows the device returning to a normal position and assisting to open the door.

Fig.14 shows the door operated by the device of Fig.13.

Fig.15 shows a reference list.

**Best Modes for Carrying Out the Invention**

Figs.1-6 are taught together showing the invention, a magnetic means 72 to control superior checks 22 and others for reciprocating devices 10. The magnet 72 may be housed within a plastic cup 70, perhaps containing twin primary magnets 72. Projected surfaces 74 include a land 74-A permitting the check 22 smooth rotations onto the variable convex surface 40A of the trigger 38, and a lock 74-B for securing the trigger 38 in both the horizontal and vertical positions. An optional check stop 74-C is for positioning the engaged check 22B vertically when using the basic tab set. Note the trigger 38 could stub or angle in various ways that the leading edge could create a variable trigger area 40. An option report 80 is provided for various reasons describe below.

The best magnet 72 seems to be Neodymium Iron Boron (NdFeB). According to the industry they are the most powerful "rare earth" magnets known to mankind which are capable of providing 4-5 times more power than ceramic magnets. They are also very hard which creates a durable plane for the convex surface 40A. The only thing that can weaken NdFeB magnets are temperatures of over 250°F. It is important that the reader understand that the exclusive invention herein consist of the primary magnet 72, wherein the cup 70 merely provides expediency for the invention.

Fig.2 shows the retrofit installation procedure for the cup 70 onto the closer device 10, through the aperture 71 onto the rod 16. It is strongly suggested that the magnetic invention 72 be fitted to the end cap 14 at manufacturing for the device 10. Please note that when retrofitting the magnet 72 onto a closer 10, the user must position the cup 70 to clear the rod hub 18 and lugs 20. No fasteners are required as the magnet 72 attaches to the end cap 14. However, an option port 80 is provided for a rivet fastener 80A to communicate with an end cap port 15, perhaps desired when retrofitting the magnet 72 to the device 10. The cup 70 and magnet 72 may be used for left or right doors 62 by simple orientation.

Fig.3 shows a superior check 22 housing an aperture 26 which opposes friction points 28 defined as the fulcrum 28A and the counter 28B. The aperture 26 is created within a structure 34 comprising offset planes 37, all components attached to a trigger 38 utilizing an arched, ovoid or convex surface 40A. The device 10 shows the check 22 mounted vertically for basic tab set, as it is typically moved by the user from idle 22A to engage 22B. Note the projected surfaces 74 including the land 74-A, the lock 74-B, and the stop 74-C maintains the trigger 38 and convex 40A, to prevent unintentional attraction for the check 22B towards the magnet 72.

Fig.4 shows the check 22 supported horizontally by the magnet 72 (hidden), now positioned for immediate tab set. To engage 22B, the user need only touch the check 22 with light force as demonstrated. To disengage 22A, the door 62 (not shown) needs to be bumped slightly outward and the magnet 72 will draw the trigger 40A to release the rod 16. Note that the user can apply slight inward force to the door 62 for securing the engaged tab 22B more firmly onto the rod 16. This will help prevent the door 62 from accidental closure due to an unintentional light bump. Certainly the user can choose basic tab set by simply again rotating the engaged check 22B to vertical.

Fig.5 shows the unique ease of operation, installation, and lack of moving parts for the magnetic invention 72 contained within cup 70. The opt port 80 may comprise a button 80B to possibly cancel the check 22A by closing the functional gap 46, as when the user forcefully attempts to close the door 62 while its held by the engaged check 22B. Perhaps these inventions may permit the magnet 72 certain movement by the biasing means 11 and end cap 14. This concept could eliminate the cup 70 entirely, or at least require a smaller diameter to better inset within the body 12.

Note that the points 28 comprised within the structure 34 have offsetting planes 37, which allow the check 22 to substantially rotate on the extended rod 16B. This rotation is limited only by the lock 74-B contacting the trigger area 40, in this illustration having a convex trigger 40A. Thus, when not in use the points 28 act as bearings or guides permitting the unusually smooth motion for the check 22 from engaged 22B to idle 22A and back to engaged 22B.

However, note that the projection of the trigger 38 could be stubbed or angled to entirely omit the convex surface 40-A. Please note that the magnet 72 might function with certain other prior checks 22 with or without triggers 38 which are variable such as the convex 40-A, perhaps by utilizing other components such as springs or levers.

Figs.6-8 are taught together showing another magnetic invention 72 provided within a wheel 82, for progressively holding the engaged check tab 22B that every outward position. This feature may be most practical for users of mobility devices, whom are exiting a screen door 62 (not shown). For this purpose, the idle tab 22A is held horizontally by the original primary magnets 72. In preparation, the wheel 82 is rotated 180° using a finger to the notches 83 which magnetically 72B draws the structure 34 to engaged the tab 22B. As the door 62A is pushed outward 62B, the combined magnets 72 progressively hold the check 22 to accommodate the mobility device.

Once outside, the user can cancel the check tab 22A by again rotating the wheel 82 then bumping the door 62 for closure. However, if the device 10 provides a damper 50 (not shown) as in US 6,640,387, the door 62 can be closed while the extended rod 16B is held by the tab 22. This will assist to open the door 62 upon return trip, wherein the user can then rotate the wheel 82 and bump the door 62 for closure. By placing magnets 72 (not shown) behind the wheel 82 at each 180° interval, a "click" stop is created for the on/off positions.

Figs.9-14 are taught together showing a closer device 10 with the magnet 72 comprised within the cup 70. A damper 50 as defined in US 6,640,387, provides a bracket 50A attaching to the device 10. The damper 50 permits the device 10 to normally act as a closer only, until remotely activated 84 to engage a lineal actuator 54. Note the magnet 72 maintains the idle check 22A horizontally, however at any time permits the user to opt for basic tab. Fig.10 shows a closed door 62A and device 10 under normal operation.

Fig.11A shows the remote activator 84 setting in motion a power supply 86 for a solenoid or small motor, to engage the check 22B with a magnetic means 72B. This prepares the device 10 and the engaged check 22B for progressive tab set similar to Fig.8. Such a power supply 86 might comprise a rechargeable 12-24V DC battery, which may be capable of operating for many months between charges. Please note that several type doorjamb brackets 61 are shown.

Fig.11B shows the remote activator 84 setting in motion a power supply 86 to the lineal actuator 54, to advance the drive 54C and extend the damper spring 54A and bracket 50A. Note that the drive 54C only requires approx. 6 inches of extension to fully open an average door 62B, and is shown after advancing the spring 54A and bracket 50A. The operator 54 does not require power to open and hold the door 62B, as the extended rod 16B, and the extended bracket 50A, and the energy of the damper spring 54A are all held by the engaged check 22B only. The low-voltage operator 54 can energize for activation while remaining in the closed door position 62A, as shown in Fig.12.

Figs.13-14 shows that the bracket 50A has caused the opened door 62B by the engaged check 22B. After a timed interval, the remote activator 84 can again set in motion the power supply 86 to the solenoid, which disengages the check tab 22A to retract the rod 16A and cause the closed door 62A. Fig.14 clearly shows that the combined inventions have caused the opened door 62B, and, note that the device 10 appears to be under normal operation as though not equipped with any additional components. Please note that if the remote 84 is inadvertently activated while in the opened door 62B, the advancing bracket 50A will only cause the door again towards the closed 62A which can overcome possible damage to the device 10.

Fig.15 shows a reference list.

**Industrial Applicability**

The present invention comprises the use of magnetism adapted for triggering check mechanisms to engage and release from biasing rods. No other closer has ever offered both basic and immediate tab set options derived from a single check. It is also important that the reader understand that only these inventions create this first known feather touch check for door closers.

By adding a simple magnetic wheel, a closer is also now capable of providing basic, immediate, and progressive tab set. The combined inventions also create the first door operator comprising an inexpensive low-voltage rechargeable battery, perhaps for residential industries. Such a device would act as a reliable closer only, until remotely energize with timed intervals to assist by opening & closing the door.

The particular embodiments of the present invention which have been illustrated and discussed herein are for demonstrative purposes only, and are not considered limited upon the scope of the appended claims. In these claims set forth it is my intent to all the inventions discovered, except as I am limited by the prior art. From this disclosure, various changes or improvements may occur wherein any applicable claims are intended to be included therein.